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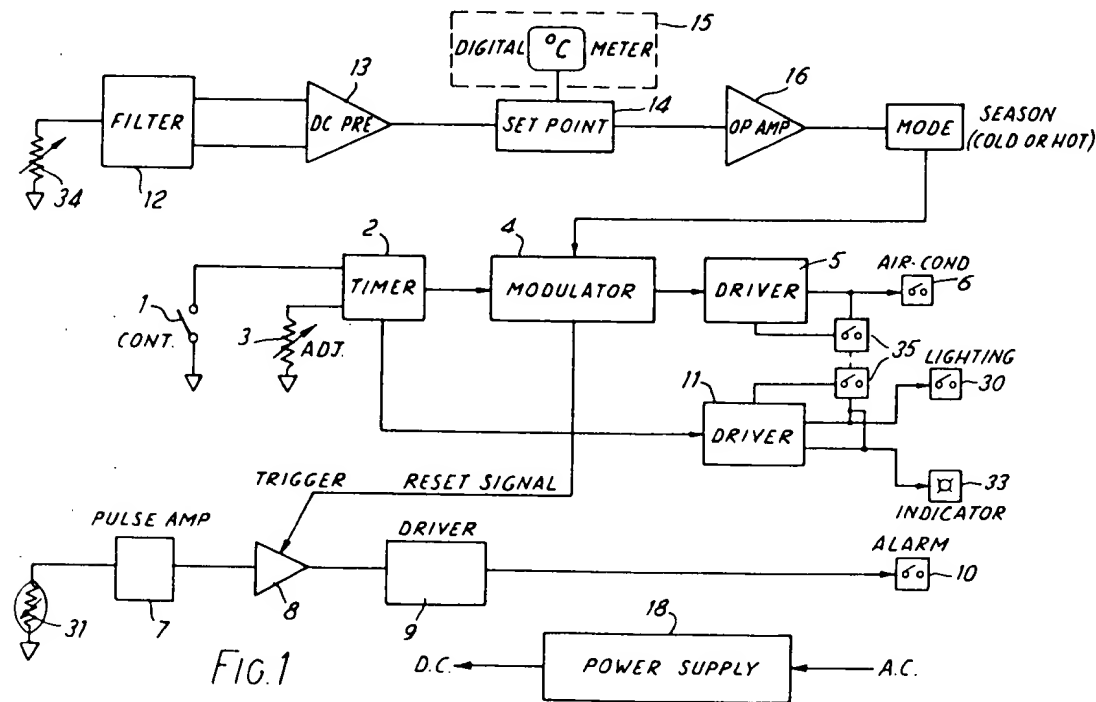
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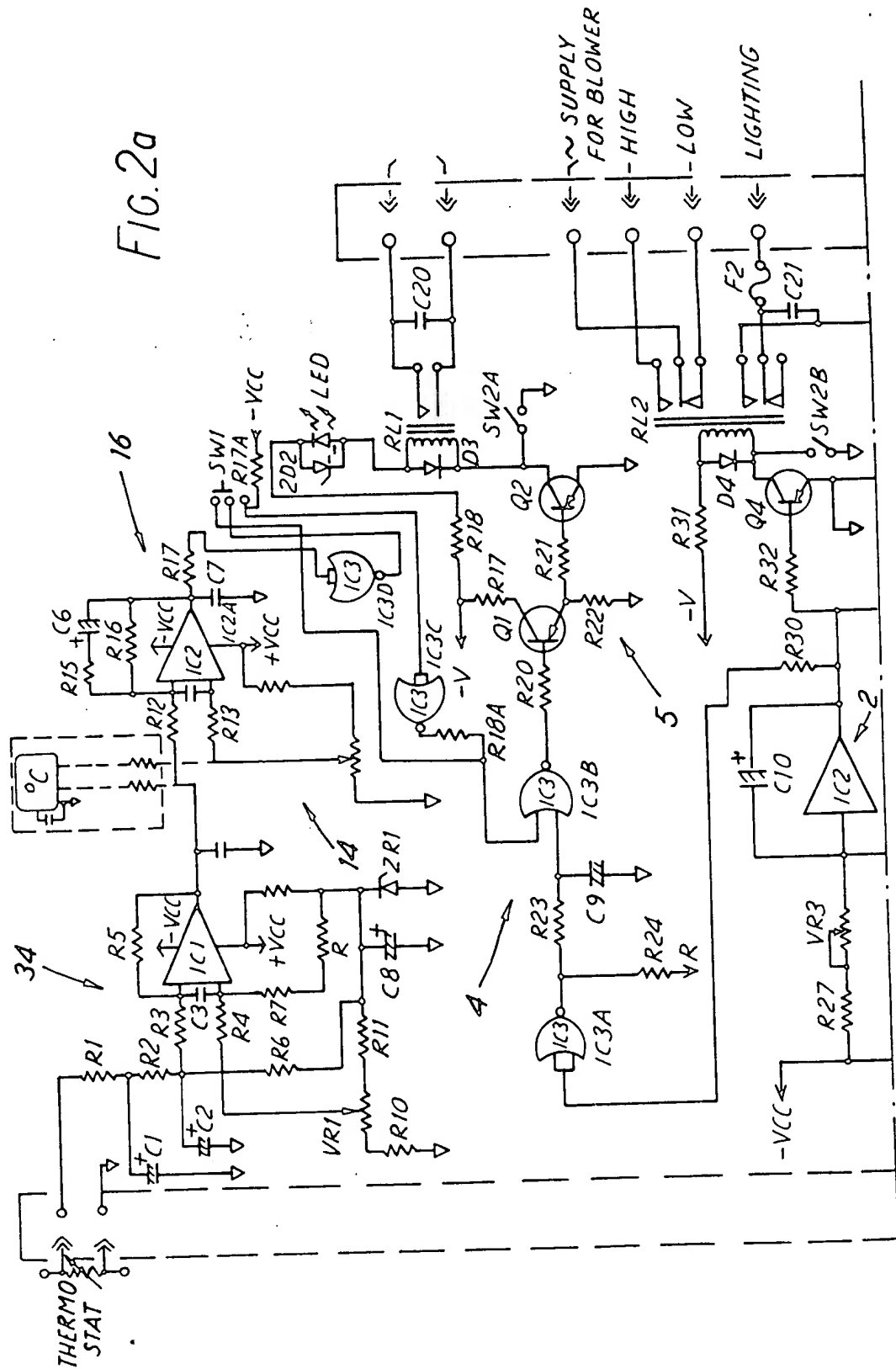
(54) Electronic control system

(57) An electronic control system comprises a switch unit (1) operable by a key or like removable token and a control circuit (2, 3, 11, 30) controlled by the switch unit (1) to cut off, from a supply of electrical power (18), appliances connected to the power supply when the key or like removable token is not present in the switch unit.



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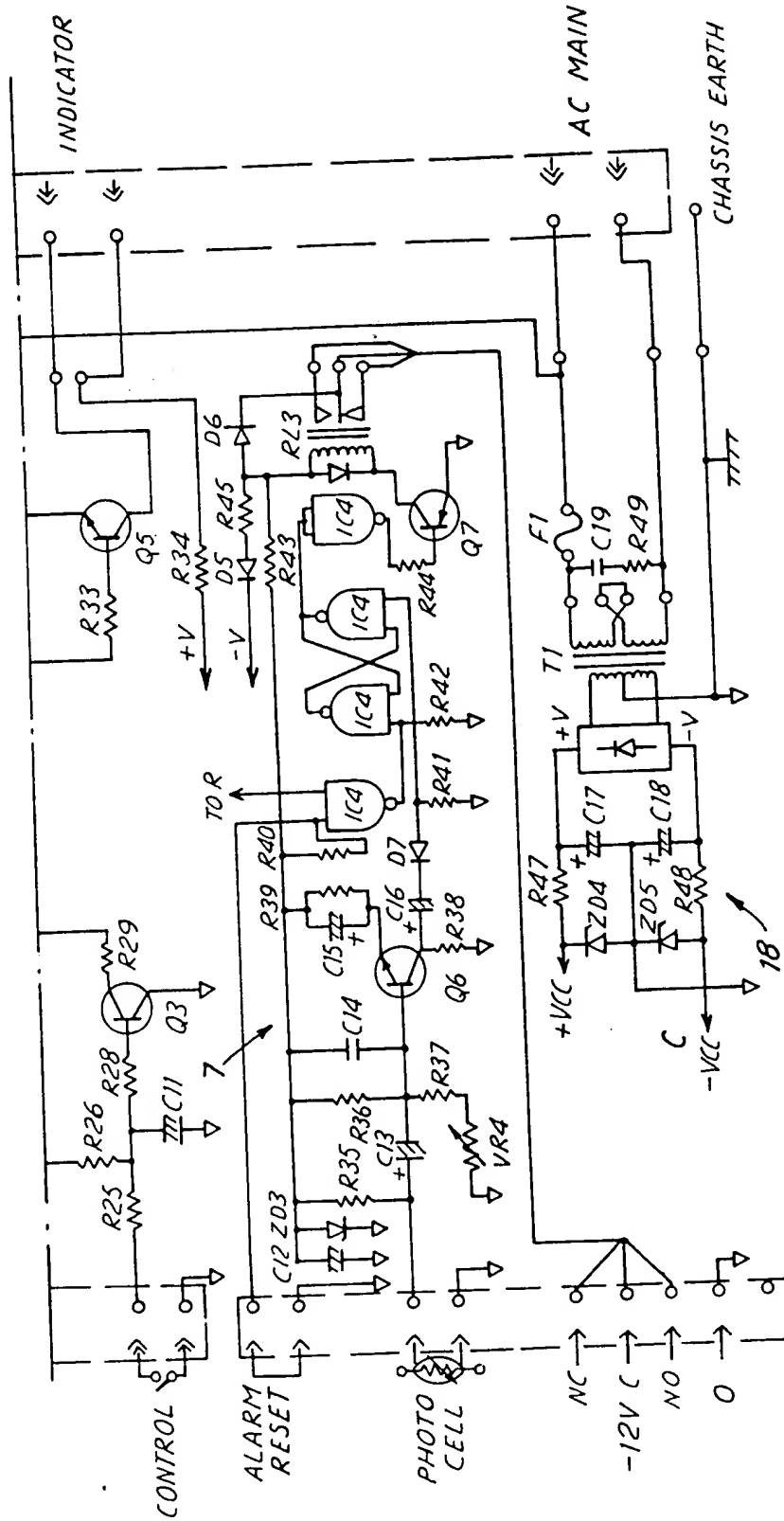


FIG. 2b

NOTE : 1 → TERMINAL CONNECTOR
 2 → PLUG SOCKET
 3 → CIRCUIT COMMON

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A photo sensor 31 connected to a pulse amplifier 7 provides a surge voltage input to trigger unit 8 to turn on the alarm 10; the alarm would cut off only when the reset signal is present at trigger unit 8. The alarm circuit includes a third driver 9. Also with the key tag present, the modulator 4 is arranged to provide a signal to control the second driver unit 5 which in turn actuates the airconditioning unit switch 6 to switch on the airconditioning. The input of the modulator 4 is connected to the output of timer unit 3 (which is not providing a time delay in this mode of operation).

When the key tag is removed from the switch, after a time delay provided by timer unit 2, there is no longer an input signal to trigger unit 11 and driver 5 and therefore the power supply from the mains is switched off and the indicator unit 33 is illuminated after the time delay.

When there is no output from timer unit 2, the temperature sensing unit 34 provides a signal to the set point unit 14 via a D.C. pre-amplifier 13 so that when the temperature falls below or rises above a predetermined level (depending on the mode of operation of the airconditioning unit) an input signal is provided to the operation amplifier unit 16 to give the positive or negative signal to the modulator 4 via the mode unit 17. The modulator 4 is arranged to actuate the driver unit 5 to switch on or off the power supply to the airconditioning unit (not shown) by way of its switch 6.

The temperature sensor unit is connected via a filter unit 12 to the D.C. pre-amplifier 13. The set point unit 14 provides a temperature setting which is indicated on a meter display unit 15.

The operation amplifier unit 16 acts as a comparator to give a positive or negative signal to the modulator 4. The mode unit 17 is a select switch by which the appropriate yearly season can be selected, i.e. winter or summer. This is particularly useful in countries having a large annual temperature fluctuation.

A by-pass switch unit 35 enables the output power circuit (lighting and airconditioning) to be by-passed when the control system fails. The power supply is indicated at 18.

Reference is now had to Figure 2 which shows a schematic circuit diagram of the control system of Figure 1. A key tag operation is provided by insertion of a short-circuited key tag into the switch unit to cut-off magnetic field and activate a reed relay switch 100. The relay contact is connected via a resistor-capacitor network including resistors R25, R26, R28 and capacitor C11 to the base of a transistor Q3. The collector of Q3 is connected via a coupling resistor R29 to one input of an integrated circuit amplifier IC2, which input is also connected to the set point

unit 14 which has a variable resistance VR3, connected in series with resistor R27 to reference voltage $-V_{CC}$ at the output C of the power supply 18.

Power supply 18 is of conventional design providing 24V D.C. unregulated outputs A and B, and regulated outputs $+V_{CC}$ and $-V_{CC}$.

The timer unit 2 is formed by amplifier IC2 and capacitor C10. The output from amplifier IC2 is coupled via resistor R33 to an indicator unit which includes a transistor Q5. The output from amplifier IC2 is also connected via resistor R32 to a driver, transistor Q4 and a control relay (lighting power). Collector of the transistor Q4 is connected to earth via the switch SW2 of a by-pass switch unit SW2A and SW2B. The output of IC2 is further connected via a resistor R30 to a negated input of IC3A.

IC3A, IC3B, IC3C and IC3D form a modulator for the signal from IC2 coupled by R30, and temperature signal from IC2A through mode selection switch SW1 to provide a signal to trigger the driver unit 5 formed by Q1, Q2, 2D2, D3, R20, R21, R22, R18, R19 and control power relay RL1 for the airconditioning unit (not shown). LED is illuminated when RL1 is energized.

Amplifier IC1, capacitor C1, C2, C3, C4, C8, Resistor R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, ZR and trimmer VR1 form the temperature sensing unit 34. The output from preamplifier unit 13 is coupled to operation amplifier IC2A via the set point 14 which comprises VR2, V12, R13, R14. The operation amplifier 16 includes IC2A, R15, R16, R17, C5, C7. The output signal is coupled by select switch SW1 to modulator IC3.

The alarm circuit includes transistor Q6, capacitor C13, C14, C15, C16 and resistors R35, R36, R38, R39, VR4 forming the pulse amplifier 7. The output of Q6 is coupled to a Schmitt trigger circuit which comprises IC4, capacitor C16 and Resistors R40, R41, R42, to give a trigger signal to Q7 coupled by R44 to control alarm relay RL3. The circuit is arranged to have an external power supply—12V, irrespective of the supply from unit 18 in case of failure.

This D.C. power supply unit 18 comprises transformer T1, bridge circuit rectifier, capacitor C17, C18, C19, resistor R47, R48, R49, zenor diode ZD4, ZD5 and fuse F1.

CLAIMS

1. An electronic control system comprising a switch unit operable by a key or like removable token and a control circuit, controlled by the switch unit to cut off, from a supply of electrical power, appliances connected to the power supply when the key or like removable token is not present in the switch unit.

2. A system as claimed in claim 1, wherein

SPECIFICATION

Electric control system

- 5 This invention relates to an electronic control system for controlling the operation of appliances and in particular, though not exclusively, for controlling electric lighting and an air-conditioning unit system
- 10 With present day ideas on energy conservation, the problem exists of ensuring that electrical appliances are turned off when not in use. This is particularly significant in hotels and similar establishments since visitors can vacate their rooms and leave lights, airconditioning, television sets etc on. Similar problems exist, to a lesser degree in commercial and industrial establishments.
- 20 The present invention seeks to provide an electronic control system which will help to ensure that energy waste due to the leaving on of appliances which are not required is minimised.
- 25 According to the invention, there is provided an electronic control system comprises a switch unit operable by a key or like removable token and a control circuit, controlled by the switch unit, to cut off the supply of power from appliances when the key or like removable token is not present in the switch unit.
- 30 Preferably a time delay circuit is provided whereby the cut off of the power supply to the appliances takes place after a delay.
- 35 Thus a user can operate the control system in a room by use of the key or like removable token to render the appliances operative and when the user leaves the room, removing the key or token from the switch unit the control system will turn off the electrical appliances, e.g. lights, after the time delay, thus saving energy in the user's absence. The time delay gives the user time to leave the room before the appliances are switched off. He also has the certainty that, having removed the key or
- 45 token from the switch unit, the electrical appliances connected to the control system will be switched off.
- 50 Preferably the control circuit of the control system further comprises temperature sensing and control circuitry arranged to control an air conditioning unit to maintain the temperature of a room at a predetermined level when the key or token is removed from the switch unit, and the control circuitry is adapted to enable the full operation of the airconditioning unit when the key or token actuates the switch unit overriding the temperature sensing circuitry. The provision of such temperature sensing and control circuitry allows for a
- 60 room, in which the control system is installed, to be kept at a desired temperature when a user is absent and for the airconditioning unit to be operated continuously as desired, when the user is present and has inserted the key or
- 65 token into the switch unit.

Room temperature may be controlled by a further thermostat unit. It may have a setting higher than the main thermostat.

- 70 Preferably an adjustable timer circuitry is provided so that the time delay may be adjusted.

- 75 The control system may further comprise by-pass switch means to enable the electrical appliances and/or the airconditioning unit to be switched on when there is a failure in the control system.

- 80 The system may further comprise a season selection which enables the airconditioning unit's basic temperature to be adjusted in dependence on the season of the year (e.g. winter or summer).

- 85 Preferably the control circuit further comprises an indicator circuit which includes light emitting means which is actuated after the key or token has been removed from the switch unit and is cut off when the key or token is present. Such an illumination circuit allows the user to locate the holder when the room is in darkness as the control system controls the light which can only be switched on after insertion of the key or token into the switch unit.

- 90 The control system may further comprise a security alarm circuit, which may function as a fire alarm and/or an anti-theft alarm which is actuated on a photo electric principle and provides an indication when a light source (which may be daylight or artificial light is momentarily blocked by human movement or are caused to fluctuate through other causes. This would trigger the alarm circuitry to actuate an alarm bell. Insertion of the key or token may be arranged to cut off the circuit.

- 95 The invention will now be described in greater detail, by way of example, with reference to the drawings in which:

- 100 Figure 1 is a block schematic diagram of one form of electronic control system according to the invention, and

- 110 Figure 2 is a schematic circuit diagram of the electronic control system whose block diagram appears in Figure 1.

- Referring first to Figure 1 of the drawing a switch unit 1 operable by a key or like removable token, is connected via a timer 2 with a delay setting control to control the whole system. The token used comprises a key tag in this embodiment. The timer 2 is connected to a driver 11 which is in turn connected to a lighting control relay 30. The timer 2 is also connected to a modulator 4. This modulator 4 is fed with a signal from a mode unit 17 which provides a positive or a negative instruction to a second driver 5 which in turn controls an ON/OFF switch 6 for the airconditioning.

- 125 The modulator 4 also sends a signal to a trigger unit 8 for resetting an alarm circuit. This reset signal is maintained until the key tag is removed from the switch unit 1.
- 130

a delay circuit is provided, connected to the switch unit to delay cut off of the appliances for a predetermined period after removal of the key or like removable token.

5 3. A system as claimed in claim 2, wherein the system is connected to control appliances in a room or a suite of rooms.

4. A system as claimed in claim 3, wherein the entire electrical power available in the room or suite of rooms is controlled by the switch unit.

5. A system as claimed in any one of claims 1 to 3, wherein temperature sensing and control circuitry is provided to control an air conditioning unit to maintain the temperature of a room as a predetermined temperature when the key or like token is removed but enables full manual control of the air conditioning unit when the key or like token is inserted into the switch unit by overriding the temperature sensing circuitry.

6. A system as claimed in claim 6, wherein a room thermostat is provided which is adjustable and which controls the air conditioning unit when the said temperature sensing circuitry is overridden.

7. A system as claimed in claim 2 or any claim directly or indirectly appendent thereto, wherein the delay circuitry includes adjustable timer circuitry for adjusting the time delay of the delay circuit.

8. A system as claimed in any one of claims 1 to 7, wherein a by-pass switch is provided to enable the electrical appliances and/or the air conditioning unit to be switched on in the event of failure of the control system.

9. A system as claimed in claim 5 or any claim appendent directly or indirectly thereto wherein a season selection switch is provided for enabling setting of the basic temperature of the air conditioning unit in dependence on the season of the year.

10. A system as claimed in any one of claims 1 to 9, wherein an indicator circuit is provided and includes light-emitting means which is actuated when the key or like token has been removed from the switch unit to illuminate the holder of the switch unit for holding the key or like token.

11. A system as claimed in any one of claims 1 to 10, wherein a security alarm circuit is provided which is actuated on a photo-electrical principle to detect when a light source is obscured or caused to fluctuate.

12. A system as claimed in claim 11, wherein the alarm circuit is rendered inoperative when the key or like token is inserted in the switch unit.

13. A system as claimed in any one of claims 1 to 12, wherein the system comprises a timer with a delay control connected to the switch unit and forming the delay circuit, a driver circuit connected to the timer and a lighting control relay driven by the driver

circuit.

14. A system as claimed in claim 13, wherein the timer is also connected to a modulator, controlled by a temperature control unit when there is no signal from the timer, the modulator being connected to a second driver circuit which is in turn connected to an air conditioning control switch or relay.

15. A system as claimed in claim 14 wherein, where the system is provided with an alarm circuit the alarm circuit incorporates a trigger stage, controlled by the modulator, for resetting the alarm circuit.

16. A system as claimed in claim 15, wherein the alarm circuit comprises a photo sensor connected to a pulse amplifier to provide a surge voltage to the trigger unit to actuate the alarm, the alarm only being cut off with the presence of a reset signal from the trigger stage.

17. A system as claimed in claim 16, wherein the temperature control unit comprises a temperature sensor unit is provided and is connected to a set point unit via a filter and pre-amplifier, the set point unit actuating an operation amplifier unit to control the modulator when the ambient temperature drops below a predetermined value.

18. A system as claimed in claim 17, wherein a mode selection circuit is provided which is located between the operation amplifier and the modulator to set the desired temperature level.

19. An electronic control system substantially as described with reference to the drawings.

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